

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Improvements relating to the production of Cinematographic Films

We, N.V. OPTISCHE INDUSTRIE "DE OUDE DELFT" of Oude Delft 36, Delft, the Netherlands, a Company incorporated under the laws of the Netherlands, do 5 hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to the production of cinematographic films.

When phenomena which are to be filmed are of poor brilliancy, it is necessary to use sensitive film material, as

15 otherwise the density would become too small in consequence of the fact that the exposure-time for each image must of necessity be short. Sensitive film material however, has small resolving power, so that the image quality expressed in the total number of lines across the height or the width of the image becomes too small.

For various applications, for instance X-ray cinematography, this small number of image lines forms a serious disadvantage, because on account of it, in the images of 16×22 mm. on the usual 35 mm. film, too few details are visible.

20 Of course for 16 mm. or 8 mm. film this disadvantage is even more serious.

Attempts have been made to obtain more details by using a film of larger

25 In this way, the result is obtained that, when the same film material with equal resolving power is used, the number of image lines increases directly proportionally to the linear dimensions of the image size. The practical realisation of this idea was hampered, however, by the circumstance that a special and complicated projection apparatus must be made for films with the large image size, instead of using the existing projection apparatus for 35 mm.

30 or 16 mm. film.

Another serious disadvantage of the use of the larger film is that the perforation necessary for transport tends to

cause tearing of the film, because the present available film material cannot stand the relatively great force which is exerted during the transport.

According to the present invention the pictures are made on an original film, preferably unperforated, of which a copy reduced by a factor k is afterwards made by photographic projection printing on a perforated copy film, the copy film having a resolving power at least k times greater than the resolving power of the original film, k being a number substantially greater than one.

On account of the larger size of the original film, pictures with considerable detail can be obtained, in spite of the limited resolving power. When the copy is made, the exposure time can be made as long as necessary, and so less sensitive films with great resolving power can be used, so that the amount of detail is not decreased. When the copy has been made in this way on 35 mm. film or 16 mm. film, the pictures are as rich in details as those on the original film, and can be projected with the aid of a normal projection apparatus.

In order to keep the camera as simple as possible, and also to avoid the above-mentioned difficulties with the perforation of larger films, an unperforated original film will be used by preference. The transport of the original film can then take place in known manner, for instance by leading this film between two rubber rolls.

The use of unperforated original film entails that when no special provisions have been made in the camera, the pictures are not always spaced apart by exactly the same distance. This disadvantage can be met by correcting possible differences in the distances between two successive pictures during the copying on to the copy film.

Preferably, the pictures on the original film are projection printed one by one on the copy film, the original film being

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3. In the above-described way the required accuracy of $1/100$ mm. in the mutual position of the pictures on the film 3 can be realised in a very simple way.
- 5 Finally, in the figure are further indicated a feed spool 15 for the copy film 3 and a feed spool 16 for the original film 1. A lamp 17 and condenser 18 provide the illumination of the image on the film 1 which is required for making the copy.
- The objective 2 is provided with a shutter, which is only opened when the film 1 has been accurately adjusted under the microscope 13.
- 15 As a matter of course, the necessary provisions are taken to ensure that the film 3 does not receive undesired light, which provisions are not indicated in the drawing.
- 20 What we claim is:—
1. A method of making a cinematographic film, wherein the pictures are made on an original film, preferably unperforated, of which a copy reduced by a factor k is afterwards made by photographic projection printing on a perforated copy film, the copy film having a resolving power at least k times greater than the resolving power of the original film, k being a number substantially greater than one.
 2. A method according to any one of the preceding claims, wherein a film giving a direct positive image is used as the copy film.
 3. A method according to claim 1 or 2, wherein possible differences in the distances between two successive pictures on the original film are corrected on the copy film.
 4. A method according to any one of the preceding claims, wherein the pictures on the original film are projection printed one by one on the copy film, the original film being transported between the printing exposures along approximately equal distances corresponding approximately to the distance between the centres of the pictures on the original film and the copy film being transported between the printing exposures along exactly equal distances corresponding to the desired distance
- between the centres of the pictures on the copy film, and after such transport of the films the position of the original film is adjusted, if necessary, so that each picture on the original film occupies the same position during the printing exposure.
5. A copying apparatus for utilising the method of claim 3 or 4, comprising film winding means for transporting an original film along approximately equal distances corresponding approximately to the distance between the centres of the pictures on the original film, an objective by which the pictures on the original film can be projected, reduced by a factor k , on to a copy film having a resolving power at least k times greater than the original film, k being a number substantially greater than one, a film winding mechanism by which the copy film can be transported along exactly equal distances corresponding to the desired distance between the centres of the pictures on the copy film, a microscope which in its operative position is fixed with respect to the objective and is focussed on the original film, the eyepiece of the microscope being provided with a mark, and adjustment means by which the position of the original film can be adjusted until a mark on the original film, which is provided in a fixed position with respect to each picture on the original film coincides with the mark in the eyepiece of the microscope.
6. A copying-apparatus according to Claim 5, wherein the film winding means for the original film is coupled with the film winding mechanism for the copy film, so that the two films can be transported at the same time.
7. A method of making a cinematographic film substantially as hereinbefore described with reference to the accompanying drawing.
8. A copying apparatus substantially as hereinbefore described with reference to the accompanying drawing.

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732.866 COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale.*

